ASSESSMENT OF COASTAL AQUACULTURE PONDS IN ASIA WITH HIGH RESOLUTION SAR DATA

Marco Ottinger[1], Kersten Clauss[1], Tuan Quoc Vo[2], Claudia Kuenzer[3]

[1] Department of Remote Sensing, Institute of Geography and Geology, University of Wuerzburg
[2] Land Resources Department, Can Tho University, Vietnam
[3] German Aerospace Center (DLR), Earth Observation Center (EOC), German Remote Sensing Data Center (DFD)

Global aquaculture - background information

Aquaculture is one of the fastest-growing animal food production sectors worldwide and is the main source of animal protein in many countries. The farming of fish, crustaceans and mollusks has attracted considerable attention in coastal areas for its high export value and potentials in terms of protein supply and global food security.

Fig. 1: Rice-shrimp field, fish net aquaculture, and shrimp pond (Vietnam).

Rising demand and international trade has driven the rapid expansion of aquaculture with an increase of global production from 13.1 Mio t in 1990 to 73.8 Mio t in 2014 (Fig. 2) and it is foreseen that aquaculture will be the main source of aquatic animal food in human consumption since capture fisheries production stagnated over the past years.

Aquaculture and the role of Asia

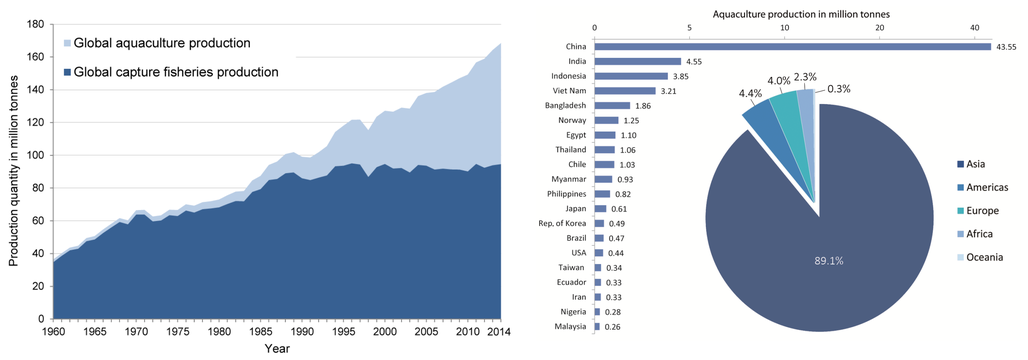

Fig. 2: Aquaculture production from 1960 – 2014 and share of production output among continents. Modified from Ottinger et al. (2016).

Nearly 90 percent of the total aquaculture production worldwide is generated in Asia – and China is by far the largest producing country with a share of more than 65. Aquaculture has mainly been developed in valuable fertile environments along the coasts in Southeast Asian and East Asian countries. This has caused large-scale land use changes, destruction and loss of coastal wetlands and pollution of waters and soils.

Data source and processing

Sentinel-1A IW GRDH data from September 2014 to February 2016 is being used as the basis for the mapping of aquaculture ponds.

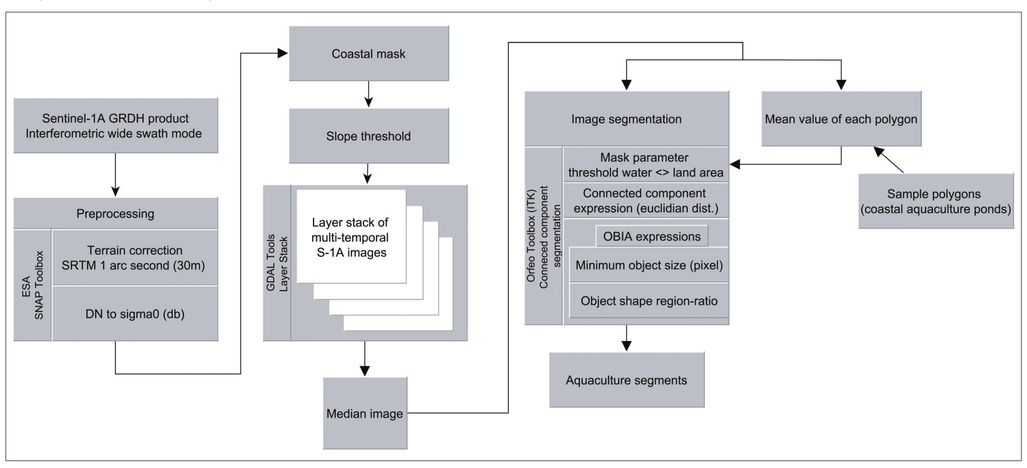

Fig. 3: Pre-processing of Sentinel-1A data and object-based aquaculture mapping.

Results and status of processing

Figure 4 illustrates the mapping result of the processed Sentinel-1A data for two test sites in Asia: Topographic information (height, slope) and a coastal zone layer (distance from shoreline) are used to mask potential areas within the Sentinel-1A stack. Training samples were used to derive water thresholds for subsequent connected component segmentation to map rectangular aquaculture ponds based on object shape features and intensity distance. The processing will be continued for major river deltas in East and South East Asia. The number of available Sentinel-1A scenes and large data volume are major challenges for processing on a large (continental) scale.

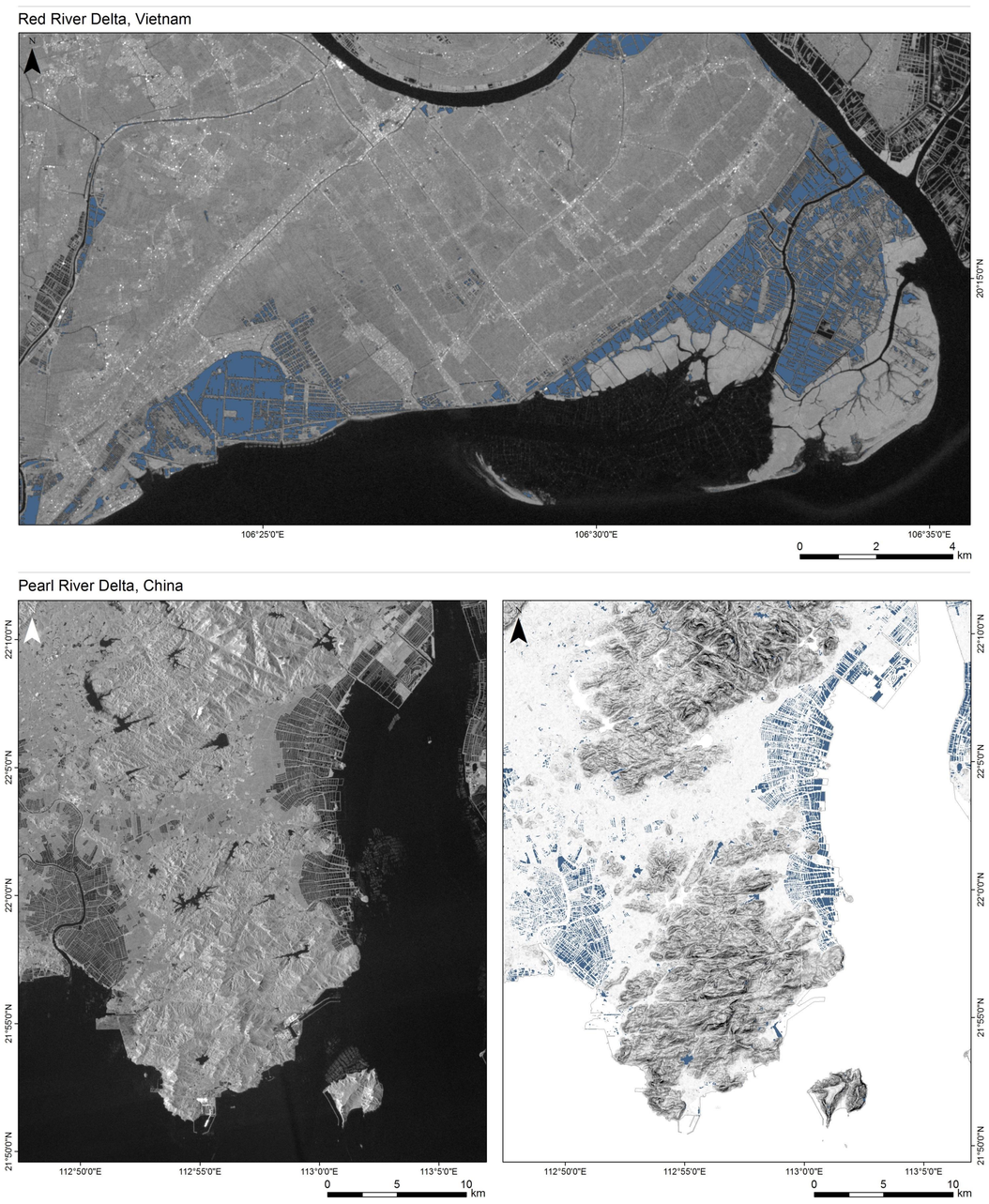

Fig. 4: Mapped coastal aquaculture objects for test sites in Vietnam (Giao Thuy district) and China (Guangdong province).

Conclusion

Quantitative assessment of the spatial extent and distribution of aquaculture is of utmost importance for global food security and a sustainable management of land and water resources. Aquaculture inventory information derived from earth observation data can effectively support the planning of aquaculture practices and help to identify and investigate environmental impacts in the coastal zone to prevent future threats to human and ecosystem health.

Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

DLR

DeltAdapt

Marco Ottinger
University of Wuerzburg
Department of Remote Sensing
Tel.: +49 8153 28-1510
marco.ottinger@dlr.de

c/o
German Aerospace Center (DLR)
Earth Observation Center (EOC)
German Remote Sensing Data Center (DFD)
Oberpfaffenhofen
82234 Weßling